ABSOLUTE TIME ERROR CALIBRATION OF GPS RECEIVERS USING ADVANCED GPS SIMULATORS

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Abstract

Precise time transfer experiments using GPS with time stability's under ten nanoseconds are commonly being reported within the time transfer community. Relative calibrations are done by measuring the time error of one GPS receiver versus a "known master reference receiver." This relative calibration can produce very stable results, but this begs the question of "how does one calibrate the master reference GPS receiver."

In this paper we will discuss the use of advanced GPS simulators to measure the absolute time error of GPS receivers. This method has the advantage of calibrating a GPS receiver independent of any GPS system biases. The use of a GPS simulator also allows testing of special conditions of the GPS system, such as year 2000 rollover and the 1024 week epoch rollover.

INTRODUCTION

With the advent of the Global Positioning System (GPS), the Precise Time and Time Interval (PTTI) community has seen great advances in the ability to compare time and frequency at great distances. In practice, relative time transfer between two timing laboratories has achieved stabilities of a few nanoseconds with averaging times of only a few days [1]. Absolute time transfer between two timing laboratories is achieved by comparing one master timing GPS receiver to a secondary receiver over a period of time at a common location. Then the secondary timing GPS receiver is relocated to a remote timing laboratory to conduct the time transfer experiment. It is assumed that this hardware delay calibration of the secondary receiver will remain fixed.